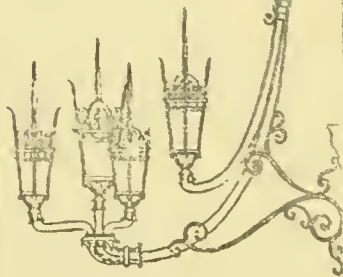


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Haley & Aldrich, Inc.

REPORT ON
OIL AND HAZARDOUS MATERIALS SITE EVALUATION
PIERS 1, 2 & 3
NORTHERN AVENUE
BOSTON, MASSACHUSETTS

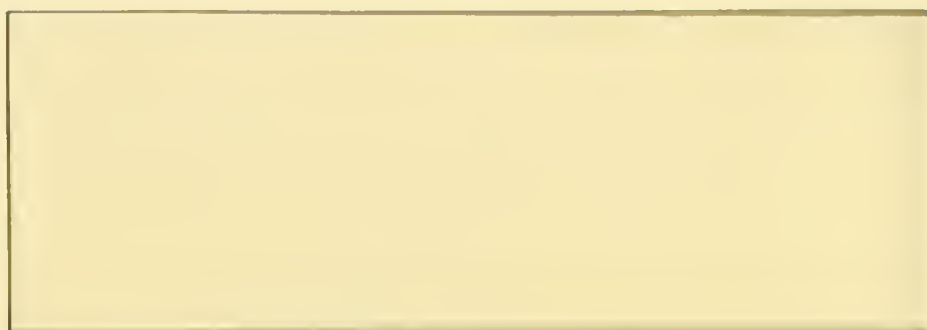
Consulting

Geotechnical Engineers,

Geologists and

Hydrogeologists

F2N Pier
365A
1984



REPORT ON
OIL AND HAZARDOUS MATERIALS SITE EVALUATION
PIERS 1, 2 & 3
NORTHERN AVENUE
BOSTON, MASSACHUSETTS

File No. 5556

December 1984





Consulting
Geotechnical Engineers,
Geologists and
Hydrogeologists

238 Main Street
P.O. Box 60
Cambridge, MA 02142
617-492-6460

11 December 1984
File No. 5556

HBC Associates
c/o Carpenter & Company
175 Federal Street
Boston, Massachusetts 02110

Attention: Mr. Harry Spence

Subject: Oil and Hazardous Materials Site Evaluation
Piers 1, 2 & 3
Northern Avenue
Boston, Massachusetts

Gentlemen:

This letter presents the results of an oil and hazardous materials assessment of Piers 1, 2 & 3 on Northern Avenue in Boston, Massachusetts. This evaluation was undertaken in accordance with our proposal for geotechnical engineering services dated 20 September 1984.

The purpose of this study was to assess the risk that oil or hazardous materials exist on or beneath the ground surface at the subject site, the release of which into the environment could fall under the jurisdiction of the Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, Chapter 21E of the Massachusetts General Laws.

This assessment has been based upon a review of historical documentation of previous site usage, available subsurface information, supplemented by laboratory test data and visual observations concerning the existing surface environmental conditions. A limited exploration program consisting of test pits and sampling for chemical analysis has been undertaken for this study. The results of this investigation are summarized in the following sections.

Branch Offices
Glastonbury, Connecticut
Portland, Maine

Affiliate
H & A of New York
Rochester, New York

I. Site Location

As shown in Figure 1, the site is located on the South Boston waterfront in an area which is zoned for waterfront industry (W-2) (1). The property under study is bounded by Boston Harbor, the Fort Point Channel, Northern Avenue, and property owned by Mr. Anthony Athanas of Anthony's Pier 4 Inc. The site is currently used for parking, and for docking facilities. A one-story sandwich shop and a warehouse are the only existing structures on site.

II. Site History and Usage

Information on the history and previous usage of the site was obtained from historical records of the Bostonian Society, the State House Archives, Haley & Aldrich, Inc. files, and other sources. The records included maps, atlases, photographs, directories and other published or available information pertaining to the site. (Refer to Appendix D - List of References.)

In 1852 this part of Boston Harbor was a tidal flat, and Piers 1 and 2 did not exist (2). The 1874 Hopkins Atlas of Suffolk County indicates that filling of the South Boston Flats had progressed as far as Summer Street (3). Figure 4 shows a portion of a plan which indicates the status of the filling of Piers 1 and 2 in 1875 (4). The plan indicates that at this time seawalls had been constructed to form Piers 1 and 2 and dredging of the harbor bottom in Fort Point Channel and Boston Harbor was progressing, with fill being placed to El. 5 in some areas, and El. 10 in other areas. The area was owned by the Commonwealth of Massachusetts and was known as the South Boston or Commonwealth Flats. It appears that a Pier 3 was originally planned between Piers 2 and 4 as shown by an outline on an 1891 atlas (5). No record of this pier having been constructed was found. By 1882 filling of the Flats was complete and railroad spur lines had been laid out to Pier 1 (5). A general chronology of development of the area is provided in Table I.

The 100 acre railroad site in the Commonwealth Flats area was initially used as a terminal by the New York and New England Railroad (6,7) which was acquired by the New York, New Haven & Hartford Corporation (NYNH&H) in 1895 (8). In the 1890's all of Pier 2 and the easternmost portion of Pier 1 was occupied by wood frame warehouse-type structures through which railroad spur tracks ran. The remainder of Pier 2 was covered with a dozen spur tracks for switching of trains (6).



The NYNH&H railroad was first listed in the 1899 City Directory for Boston as occupants of a wharf in South Boston (9). The South Boston Terminal had the advantage of fronting on deep water in the harbor and could service the transatlantic freight steamships which were calling at the Port of Boston at that time (7).

A photograph of the terminal area taken in 1906 confirms that the Piers were occupied by warehouse structures. The photo shows an ocean freighter unloading at Pier 2 and railroad freight cars stored in the railroad yard on Pier 1. Two transportation companies which used Pier 2 after 1914 were the Merchants & Miners' Line and the Boston and Philadelphia Line, which may have used the terminal for unloading coal (8).

A 1919 Bromley atlas confirms that the Merchants & Miners' Transportation Company was using Pier 2 and indicates that the two large warehouse structures shown on earlier plans still occupied portions of the site (10).

Site usage from 1930 through 1981 is summarized on Table II which indicates that a variety of tenants occupied the site throughout this fifty year period. Between 1934 and 1967 the two large original warehouses were razed and were replaced by two smaller warehouses, one of which exists on site today (11,12). Pier 1 was used through the years by a variety of businesses including railroads, shipping agents, warehouse, freight and trucking companies. Other tenants included a number of grape distributors, a salt company, and a company which manufactured or distributed chemical refrigerants. In recent years, since 1960, the site has been used for parking, although the City directories still list railroads as site occupants, and the area adjacent to Fort Point Channel has been used for boat docking. In addition, a lobster dealer utilizes the end of Pier 2 for a storage yard and docking area.

Pier 2 usage has involved the NYNH&H railroad, the U.S. Government during World War II (for a purpose which could not be determined at this time), and a variety of transportation, distributing and warehouse companies. The area between Piers 2 and 4 along Northern Avenue was occupied by a variety of seafood companies between 1935 and 1960.

During the 1960's Mr. Anthony Athanas acquired the property, and in 1969 filling of the area between Piers 1 and 2 began. During 1971 additional fill was placed to create the land area of the site between Piers 2 and 4 (13).



Records indicate that a license to store 30,000 gallons of various fuel oils was issued to the NYNH&H railroad in 1957. The license permitted storage of 10,000 gallons of gasoline and 20,000 gallons of diesel fuel in underground tanks on railroad property at 28 Northern Avenue (Pier 1). No plan indicating tank locations was found, and the file does not contain any tank removal permits. The license was renewed until 1962 (14). It is likely that other underground storage tanks were installed on the site during its history, however no other licenses to store oil, gasoline or chemicals were located.

A computer search of the Archives of the Boston Globe was also undertaken to determine if the site was once used by companies dealing with the ocean disposal of radioactive wastes. No indication was found of the site having been used for this purpose. The search indicated that Crossroads Marine Disposal Corporation which dealt with these activities, operated out of T Wharf (adjacent to Long Wharf), in Boston proper.

III. Present Site Conditions

The site as it currently exists can be divided into four areas: original Pier 1, fill area between Piers 1 and 2, original Pier 2, fill area between Piers 2 and 4. Figure 2 indicates the limits of these four areas and the following discussion will include references to these areas.

The original Pier 1 area is currently operated as a parking lot by Park & Lock Inc. Some of the area is covered with cobblestones and the remainder is partially paved. The portion of this area that fronts on Fort Point Channel is used for docking facilities by A. C. Cruise Line, which operates excursion boats. Santoro's Submarine Shop is located at 50 Northern Avenue. The one-story restaurant is heated by gas piped in from the street. An electrical transformer which provides power to light poles in the parking lot area is attached to the back of the structure (15). An existing one-story warehouse shown on Figure 2 is used by Anthony's Pier 4 Inc. as a warehouse and several refrigerator trucks for cold storage are located adjacent to the structure. A fenced-in area with a concrete pad is visible at the end of the structure closest to Northern Avenue, and was formerly used to support refrigeration equipment. The railroad spurs and larger one-story warehouse shown on Figure 2 are no longer present. Two lines of old abandoned railroad cars are



presently stored parallel to the original limit of Pier 1. Within this area of the site a drainage pipe collects surface water drainage from a series of drain drop inlets and carries the flow into the Harbor.

The area designated as the 1969 fill area (between Pier 1 and 2) is presently partially paved and used for parking, and is partially covered with a large pile of granite blocks with numerous smaller piles of miscellaneous fill (sand, gravel, boulders, asphalt).

The area occupied by the original Pier 2 is presently partially paved, and approximately half of the area is used for parking. A portion of the Pier is fenced off and utilized by a seasonal lobster business.

Part of the 1971 fill area falls within the limits of the study area and is paved and used at present for parking. The portion of this area closest to the water was formerly occupied by a tent for outdoor functions associated with Anthony's Pier 4 Restaurant. Out-door carpeting is still in place in this area, and a fenced-in pad for an above-ground fuel storage tank is evident, along with two gas burners which were used to heat the tent (16).

IV. Subsurface Conditions and Water Levels

Numerous subsurface exploration programs consisting of test borings were conducted at the site between 1940 and 1970. The legend on Figure 2 gives details of these exploration programs and the plan indicates the locations of the thirty two borings which fall within the limits of the current study area.

On 4 and 5 October 1984 a total of 15 test pits were excavated within the study area using a Case 580D backhoe provided by J. Marchese & Sons Inc. of Everett, MA. Logs of the recent test pits are included in Appendix A and test pit locations are shown on Figure 2.

Subsurface stratification throughout the site is complex and the geologic history is presented in the Haley & Aldrich, Inc. report entitled "Final Draft Report on Preliminary Geotechnical Evaluation for the Proposed Development of Piers 1, 2 and 3, South Boston, Massachusetts" dated 12 October 1984. The fill and organic deposits are relatively recent soil units which are significant to this study. The elevation of



the bottom of these two units is shown on Figure 3. In general, the organic deposits consist of organic silt with shells and a variable clay content. The fill deposits were placed during a series of filling episodes which are discussed in detail below.

Filling of the original Piers 1 and 2 took place between 1874 and 1882 and was accomplished by dredging material from adjacent Boston Harbor and Fort Point Channel and placing the dredged material within the limits of granite seawalls. Borings made within the limits of these seawalls indicate that the fill consists of two types of material: dredged fill which contains organic silt, intermixed shells, clay and sand, and miscellaneous granular fill consisting of sand and gravel with minor amounts of wood, ash, cinder and brick. It is likely that the two types of fill came from different sources, the dredged material from the Harbor and the Channel, and the miscellaneous granular fill from excavations in and around Boston which may have been mixed with some debris from the Boston Fire of 1872 (4,8). Recent test pits confirm the presence of the dredged fill generally below a depth of 4 to 5 feet. Granular fill is present between a depth of 1.5 ft. and 4 ft. and is mostly sand and gravel. The upper 1 to 1.5 ft. of fill which may have been placed during the past twenty-five years, is generally a silt and sand mixture with little gravel and trace amounts of loam, cinders, brick, glass, tile, shells, wood and metal. Test borings drilled throughout the Pier 1 and 2 areas and test pit 84-2 indicate that the granular fill deposits extend deeper than 5 ft. in some areas, and that cinders, ash and wood were encountered within these deeper fill deposits in some borings.

During the period April through October 1969, the area between Piers 1 and 2 was filled by Consalvo Trucking Inc. Filling activity was monitored by a person retained by Anthony's Pier 4 Inc. and intermittently by Haley & Aldrich, Inc. A building rubble and rock dike was initially constructed at the outboard end of the Pier 1-2 slip. Then filling progressed from Northern Avenue outward to the dike. Fill materials for the filling operation were generally obtained from excavations in the Boston area and consisted of inorganic mineral soils and dispersed building rubble including brick. Specifications for fill materials precluded boulders greater than 12 inches in diameter as well as organic soils, wood, trash and other deleterious materials. During the filling operation a "mudwave" of soft organic materials was created and the organic material was trapped between the dike and



Pier 2 seawall. Truckloads of fill materials were observed by an on-site representative of Anthony's Pier 4 Inc. and loads of unsuitable material (i.e., loads with large amounts of wood, scrap metal, peat, brick, oil., etc.) were reportedly rejected.

During this same time period the easterly seawall of Pier 2 which had undergone significant lateral and vertical movement was stabilized. The existing backfill materials behind the wall were removed to a depth of approximately 19 feet and a lightweight aggregate, Masslite, was placed behind the wall to reduce lateral pressure acting on the wall (13).

Recent test pits located in the Pier 1-2 slip confirm that the fill material appears to conform to specifications, consisting of a heterogenous mixture of sand, gravel, silt and cobbles with small amounts of metal, loam, shells, brick, concrete and wood. Borings drilled following filling in 1970 and recent test pits also indicate the presence of trace amounts of brick and wood, and some zones of sandy or silty clay.

During the period May through December 1971, an area between Piers 2 and 4 was filled. Fill placement by Consalvo Trucking Inc. was monitored by a representative of Anthony's Pier 4 Inc. Specifications for fill materials prepared by Haley & Aldrich, Inc. required that inorganic mineral soils and brick having a maximum size of 12 inches (including clay, glacial till, sand, gravel, dispersed building rubble or other inorganic material) be placed in the area between Piers 2 and 4. A recent test pit excavated in part of this fill area indicates that the fill is generally a heterogenous mixture of silt, sand and gravel, with trace amounts of shells, concrete, wood and brick.

Water levels at the site are influenced by the tidal fluctuations in Boston Harbor and will vary depending on the tidal level at a given time.

VI. Chemical and Laboratory Testing Program

During the recent test pit excavation program, soil samples were obtained for a chemical testing program to assist in evaluating the potential presence of oil or hazardous materials at the site. Samples of soil materials representative of the filling episodes outlined above were obtained and tested



for concentrations of selected metals, oil and grease, chlorides, volatile solids and other compounds. Samples from test pits 84-6A, 84-11, 84-12, 84-13, 84-7 were analyzed for oil and grease and petroleum hydrocarbons, and for concentrations of chlorinated pesticides and PCB's. Concentrations of selected metals and other inorganic constituents were determined for samples from test pits 84-6A, 84-11, 84-12 and 84-13. Field monitoring for the presence of volatile organic compounds with an HNU Systems, Inc. PI 101 photoionization analyzer indicated the presence of volatile organic compounds in only test pit 84-11. Therefore, lab analysis for these compounds as well as acid/base/neutral extractables was performed only on a sample from this pit. Results of the chemical testing are included in Appendix B.

The data indicate that the soil samples do not contain any PCB's or pesticides and that chlorides were present at concentrations of 18 to 110 parts per million. Elevated levels of heavy metals exist in the fill materials at the site, as indicated on Table 3 of Appendix B. These levels are within the range typically found at other Boston sites where fill is present. Concentration of oil and grease in soil samples ranged from 0.3 to 13.8 mg/g. Petroleum hydrocarbons were found in test pit 84-11 at a concentration of 4,200 ug/g (ppm). The analysis for concentrations of volatile organic compounds in soil from test pit 84-11 confirmed the presence of hydrocarbons at 7,500 ug/kg (ppb), as well as total xylenes at 240 ug/kg (ppb). One base neutral compound, 2-methyl naphthalene was detected in soil from test pit 84-11 at 4.4 ug/g (ppm). The site history does not indicate any on-site source for the 2-methyl naphthalene. Records do indicate past storage of 20,000 gallons of diesel fuel and 10,000 gallons of gasoline on-site in underground tanks. Either of these could be a source of the hydrocarbons and xylenes.

Grain size analysis classification of four samples from test pits 84-6A, 84-11, 84-12 and 84-13 were performed in the Haley & Aldrich, Inc. laboratory. The results of these tests are included in Appendix C.

VII. Conclusions

Observations made at the site and our review of available information indicate that oil or hazardous materials are not likely to be a major issue controlling site development.



A review of past site usage indicates that a portion of the site (Pier 1 area) was occupied through the years by a variety of businesses, a few of which stored oil and chemicals on site. Available information indicates that some local areas of contamination exist as a result of this past usage. Test pit 84-11 encountered volatile organic compounds in the soil, which were identified as hydrocarbons and xylenes. The source of the petroleum hydrocarbons was indicated to be microbially degraded No. 2 fuel oil. Historical records indicate the presence of underground fuel oil storage tanks on Pier 1 as well as past usage as a rail yard.

The scope of this work did not include field work to determine the location of underground tanks. While there is no record of any loss of product found during this study, it is probable that where underground oil storage tanks exist, some local contamination exists. It is also probable that areas will be found where spilling occurred from diesel fueled locomotives. It is recommended that additional research be done to locate possible storage tanks and that future explorations include tests to determine the extent of the local contamination. Other than local conditions such as these, work to date has indicated no major problem with contamination of the subsurface soils and groundwater.

Chemical tests have indicated elevated levels of heavy metals, oil and grease, and petroleum product contamination in localized areas. Although there are limited public health or safety risks or other adverse environmental impacts currently associated with these materials, it appears that technically, areas of the site would fall under the jurisdiction of Chapter 21E of Massachusetts General Laws because of the presence of "oil".

If oil-contaminated soils are excavated during construction, the Department of Environmental Quality Engineering (DEQE) will require disposal of these materials at an approved landfill site. We believe that DEQE would not require any additional remedial action. If additional investigation during future studies indicate the presence of oil or hazardous materials other than those identified to date, we would recommend a program of additional sampling and testing to determine the nature of the contamination and the applicability of MGL Chapter 21E.



HBC Associates
1984

-10-

11 December

This letter has been prepared for the exclusive use of HBC Associates. The work has been undertaken in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

We appreciate the opportunity to undertake this investigation for you. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely yours,
HALEY & ALDRICH, INC.

Deborah H. Gevalt
Senior Geologist

Wesley E. Stimpson
Vice President

DGH:WES:lcb:0421s
Enclosures

Table I -	Chronology of Significant Historical Events
Table II -	Summary of Past Site Usage
Figure 1 -	Project Locus
Figure 2 -	Site and Subsurface Exploration Location Plan
Figure 3 -	Top of Inorganic Soils Contour Plan
Figure 4 -	1875 Plan of Filling South Boston Flats
Appendix A	Test Pit Logs
Appendix B	Results of Chemical Analysis
Appendix C	Summary of Laboratory Soil Test Data
Appendix D	List of References

xc: David E. Thompson, Haley & Aldrich, Inc.



Tables

Table 1. *Summary of the data sets used in the study. The number of subjects, the number of trials, and the number of trials per subject are shown for each data set.*

Data set	Number of subjects	Number of trials	Number of trials per subject
1	10	100	10
2	10	100	10
3	10	100	10
4	10	100	10
5	10	100	10
6	10	100	10
7	10	100	10
8	10	100	10
9	10	100	10
10	10	100	10

Table 2. *Summary of the data sets used in the study. The number of subjects, the number of trials, and the number of trials per subject are shown for each data set.*

Data set	Number of subjects	Number of trials	Number of trials per subject
1	10	100	10
2	10	100	10
3	10	100	10
4	10	100	10
5	10	100	10
6	10	100	10
7	10	100	10
8	10	100	10
9	10	100	10
10	10	100	10

Table 3. *Summary of the data sets used in the study. The number of subjects, the number of trials, and the number of trials per subject are shown for each data set.*

Data set	Number of subjects	Number of trials	Number of trials per subject
1	10	100	10
2	10	100	10
3	10	100	10
4	10	100	10
5	10	100	10
6	10	100	10
7	10	100	10
8	10	100	10
9	10	100	10
10	10	100	10

Table 4. *Summary of the data sets used in the study. The number of subjects, the number of trials, and the number of trials per subject are shown for each data set.*

Data set	Number of subjects	Number of trials	Number of trials per subject
1	10	100	10
2	10	100	10
3	10	100	10
4	10	100	10
5	10	100	10
6	10	100	10
7	10	100	10
8	10	100	10
9	10	100	10
10	10	100	10

Table 5. *Summary of the data sets used in the study. The number of subjects, the number of trials, and the number of trials per subject are shown for each data set.*

Data set	Number of subjects	Number of trials	Number of trials per subject
1	10	100	10
2	10	100	10
3	10	100	10
4	10	100	10
5	10	100	10
6	10	100	10
7	10	100	10
8	10	100	10
9	10	100	10
10	10	100	10

TABLE I

CHRONOLOGY OF SIGNIFICANT HISTORICAL EVENTS

PIERS 1 & 2, 3 NORTHERN AVENUE
BOSTON, MASSACHUSETTS

1852	Site area undeveloped, part of tidal flats in South Boston known as Commonwealth Flats or South Boston Flats
1872	Great Fire of 9 November 1872, Boston
1875	Excavation and filling of Piers 1 and 2 in progress
1882	Filling of Piers 1 and 2 complete, railroad spurline in place
1891	New York and New England Railroad Terminal (later New York, New Haven & Hartford Railroad) well established on Piers 1 and 2
1960's	Railroad operations cease, off-street parking commences
1969	Fill placement between Pier 1 and Pier 2
1971	Fill placement between Pier 2 and Pier 4

TABLE II

SUMMARY OF PAST SITE USAGE (1)

PIERS 1 & 2, 3 NORTHERN AVENUE
BOSTON, MASSACHUSETTS

<u>Address</u>	<u>Site Usage</u>	<u>Date(s)</u> (2)
Pier 1	New York, New Haven & Hartford RR Yard No. 5 - Northern Terminals Penn Central	1899, 1930, 1940, 1945, 1950, 1955, 1960, 1965 1970, 1975
	Conrail No. 5 Yard	1981
	Morello's Restaurant	1930, 1935, 1945, 1950, 1955, 1960
	Santoro's Submarine Shop	1965, 1970, 1975, 1981
	Furness Withey & Co. Ltd. (Steamship agents)	1930, 1935
	Yankee Shippers Agents Inc. (brokers)	1960
	Commercial Warehouse & Storage Co.	1950, 1955
	Hartford Despatch Co. Forwarders	1935
	Hartford Despatch & Warehouse Co.	1935
	Arch Haulage Corp.	1930
	Beacon Fast Freight Corp.	1930
	Smart Transfer Co.	1930
	Stone's Express, Inc.	1930, 1935
	National Carloading Corp.	1960
	Radin Inc. Trucking	1970
	Gray Lines Transportation Terminal	1975
	New England Grape Distributors	1960, 1965, 1970
	New Grape Yard Wholesale Wine Grapes	1960
	Independent Grape Distributors	1970

TABLE II (continued)

<u>Address</u>	<u>Site Usage</u>	<u>Date(s)</u> (2)
	National Chemical Refrigerant Corp.	1955, 1960, 1965
	Atlantic Salt Co.	1935, 1940, 1945, 1950, 1955, 1960, 1965
	Fireboat	1935
	U.S. Coast Guard	1935
	Boston Landing Co. Boat Rental	1960
	Ross Tow Boat Co.	1975
	A. C. Cruise Line Tours	1981
	Boston Landing Auto Park	1960
	Pier 4 Parking Lot	1975
	Park & Lock Parking Lot	1981
Pier 2	Armstrong Transfer Express Co.	1930, 1935, 1940
	Coastwise Express	1930, 1935, 1940
	Merchants & Miners Transportation Co.	1930, 1935, 1940
	P. Riordan Forwarding Co.	1940
	Railway Express Terminal Garage	1950
	American Packers Box Co., Inc.	1955
	Abbey Warehouse Corp.	1960, 1965
	Burke Distributing Co.	1965
	U.S. Government	1945
	NYNH & H Railroad	1955, 1960
126-132 Northern Ave.	Consolidated Lobster Co.	1935, 1940, 1945, 1950
	Boston Lobster	1935, 1940, 1945, 1950
	Powell & Nickerson	1935, 1940, 1945, 1950
	Northern Seafood Co.	1955
	James Hook & Co. Lobster	1960

NOTES:

1. Site usage was determined by reviewing city directories for the following years: 1930, 1935, 1940, 1945, 1950, 1955, 1960, 1965, 1970, 1975, 1981.
2. In general, dates given indicate when listing occurred in city directories. Actual site occupancy by a given business may have spanned a number of years.

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Figures

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

Figure 20

Figure 21

Figure 22

Figure 23

Figure 24

Figure 25

Figure 26

Figure 27

Figure 28

Figure 29

Figure 30

Figure 31

Figure 32

Figure 33

Figure 34



SITE COORDINATES: 331500E 4690900N



HALEY & ALDRICH, INC.
CAMBRIDGE, MASSACHUSETTS

CONSULTING GEOTECHNICAL ENGINEERS, GEOLGISTS AND HYDROGEOLOGISTS

HBC ASSOCIATES
FAN PIER DEVELOPMENT
SOUTH BOSTON, MASSACHUSETTS

PROJECT LOCUS

U.S.G.S. QUADRANGLE: BOSTON SOUTH, MA

APPROX. SCALE 1:25,000

JANUARY 1986

FILE NO. 5556 A22

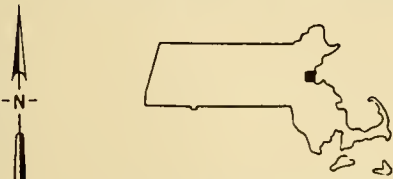
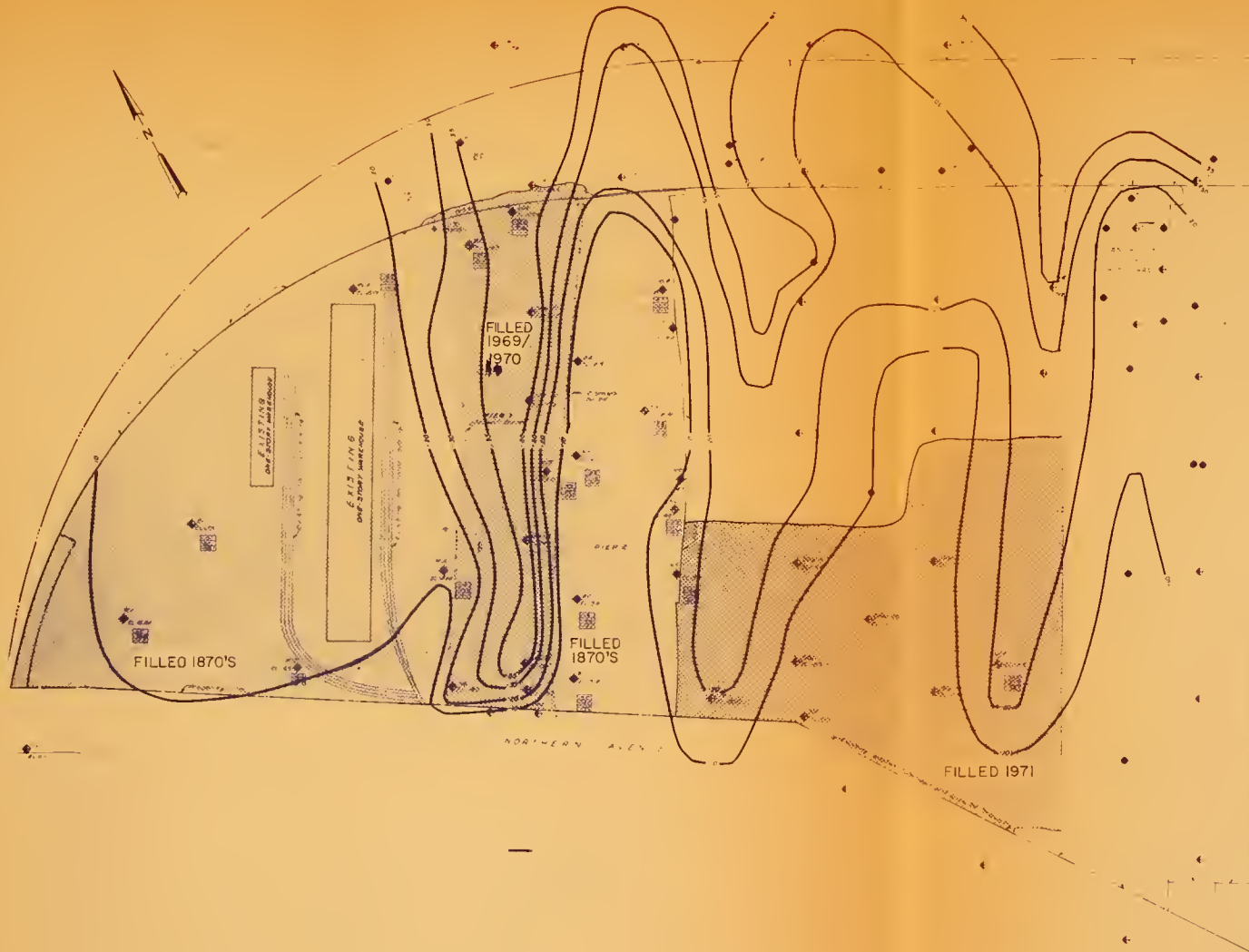


FIGURE 1







PLAN PREPARED FROM DATA
PRESENTED IN 1971 H&A REPORT


	HALEY & ALDRICH, INC. CAMBRIDGE, MASSACHUSETTS CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS
	PIERS 1-2-3 MASTER PLAN DEVELOPMENT BOSTON, MASSACHUSETTS
	TOP OF INORGANIC SOILS CONTOUR PLAN
	SCALE: 1" = 200' OCTOBER 1984

FIGURE 3

NOTE:

FIGURE BASED ON ORIGINAL MAP
IN MA. STATE HOUSE ARCHIVES;
FIGURE HAS BEEN REDUCED.

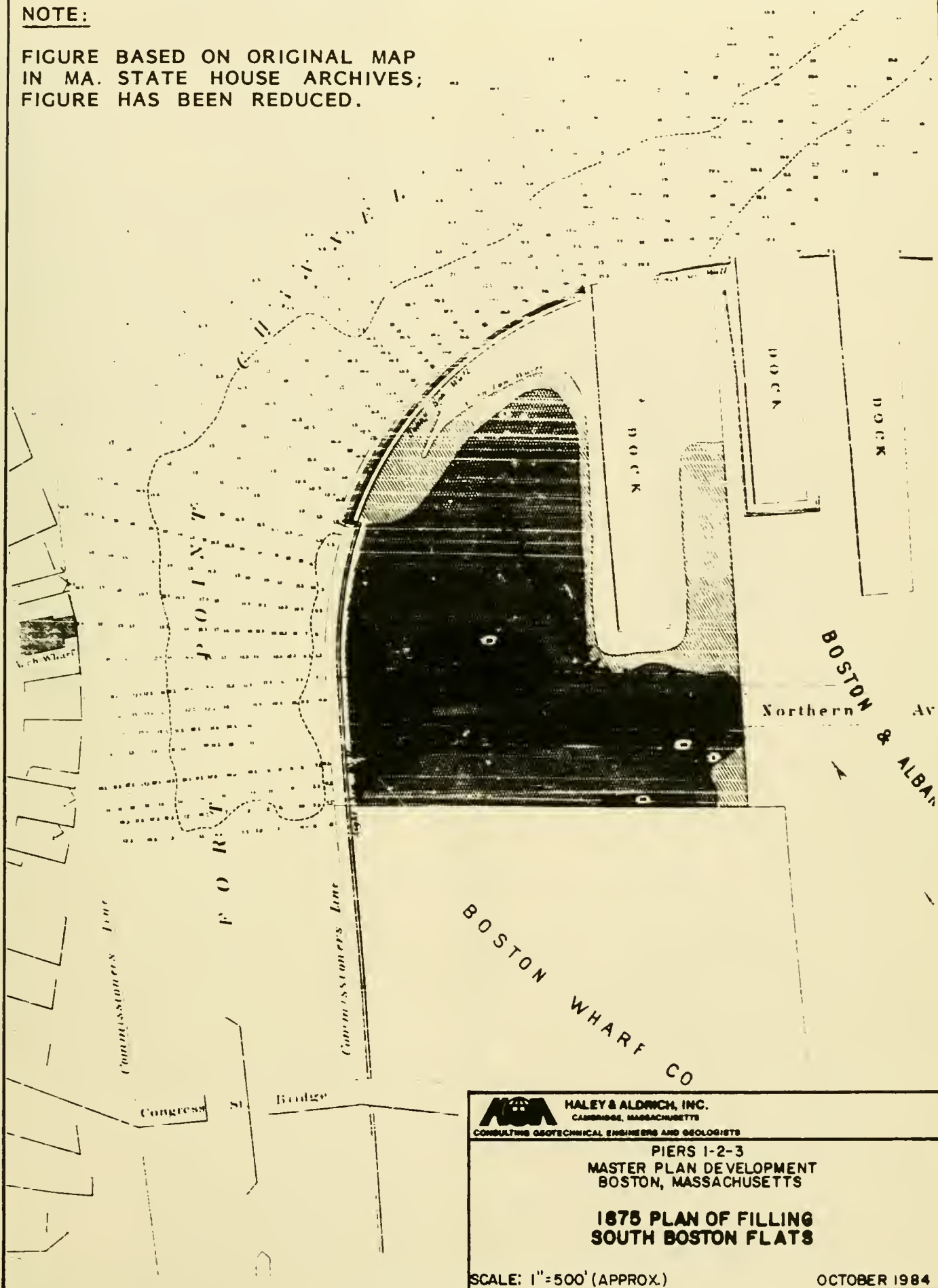


FIGURE 4

Appendix A

Appendix A

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APPENDIX A
TEST PIT LOGS

TEST PIT NO. 84-1

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

FILE NO. 5556

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

LOCATION: See Plan

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

ELEVATION: 18±

EXPLORATION DATE: 4 Oct. 84

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	1.8			Dark brown-dark grayish-black silty coarse to fine SAND, some coarse to fine gravel, trace coarse sand, cobbles, brick, tile, loam, small boulders.	Note: All materials encountered in <u>all</u> test pits consisted of various types of fill, the repetitive use of "FILL" has been deleted from the log descriptions.
	2.6			Dark brown silty medium to fine SAND, little coarse to fine gravel, trace coarse sand, wood, glass, tile, brick, cobbles.	
	2.7			Black CINDERS.	
4	4.0			Tan brown fine SAND, little silt, trace coarse to medium sand and coarse to fine gravel, few small cobbles.	
	4.7			Brown to rust brown coarse to fine SAND, trace coarse to fine gravel, silt, cobbles with pockets of gravelly sand.	
6	5.2			Yellow brown mottled silty CLAY, trace blue-gray, slightly organic silt pockets, fine sand.	
	7.0			Blue-gray very slightly organic clayey SILT, some fine sand, trace black organic silt pockets.	
8				Blue-gray very slightly organic to inorganic silty CLAY with some fine sand.	
10					
12					
				Bottom of Exploration 12.5 ft.	

GROUNDWATER							SUMMARY				
DATE	TIME*	DEPTH/FT.									
Soil damp at 5.0		ft.	12	x	3	x	12.5	=	450	DEPTH	12.5 ft.
but no water entering pit.			(L)		(W)		(D)			JAR SAMPLES	-
			BOULDERS						BAGS SAMPLES		-
			8" to 18" DIAM: No.	5	= Vol.	5	Cu. Ft.		GROUNDWATER		-
			Over 18" DIAM: No.	2	= Vol.	8	Cu. Ft.		TEST PIT NO.		84-1
NOT ENCOUNTERED	X	• HRS. AFTER COMPL.									

TEST PIT REPORT

TEST PIT NO. 84-2

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18.5±

EXPLORATION DATE: 4 Oct. 84

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	1.3			Dark brown medium to fine SAND, little silt and coarse to fine gravel, trace coarse sand, cobbles, brick, concrete, granite blocks, bituminous pavement and loam.	See note TP 84-1
		B1	1.0 to 2.9	Dark gray silty medium to fine SAND, little coarse to fine gravel, trace coarse sand, brick, concrete, wood, loam, shells, metal, glass, fibrous peat chunks.	Trapped water entered pit slowly at 9.5 ft.
4				Yellow-brown to gray-brown clayey SILT, some fine sand, trace cinders, pottery, loam, gravel, wood (1'X2' pocket black cinders in pit wall).	
6				Yellow-brown to gray-brown mottled silty CLAY, trace brick, wood, cinders, gravel, small log.	
8				Black to dark gray silty medium to fine SAND, trace coarse to fine gravel, wood, brick, cobbles, shells, stumps, metal (slight petroleum odor).	Soil wet.
10	10.0			Yellow-brown to gray-brown mottled silty CLAY, little fine sand, trace brick fragments, wood, coarse sand, fine gravel with pockets of silty sand.	
12				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	HRS. AFTER COMPL.

15 x 4 x 12 = 720 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. 3 = Vol. 3 Cu. Ft.
Over 18" DIAM: No. - = Vol. - Cu. Ft.

SUMMARY

DEPTH 12.0 ft.
JAR SAMPLES -
BAGS SAMPLES 1 Bag
GROUNDWATER -
TEST PIT NO. 84-2

TEST PIT REPORT

TEST PIT NO. 84-3

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 19±

EXPLORATION DATE: 4 Oct. 84

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
	0.4			Dark gray crushed STONE.	
2	2.0			Black silty medium to fine SAND, little coarse to fine gravel, trace cinders, ash, wood, metal, brick, small boulders.	
4				Yellow-brown medium to fine SAND, little silt, trace coarse sand and coarse to fine gravel.	
6	5.0	B1	6.0 to 8.0	Dark bluish gray very slightly organic clayey SILT to silty CLAY, some fine sand, trace wood, shells, fine gravel, cobbles with pockets of silty fine sand to fine sandy silt.	See note TP 84-1
8					Trapped water entered pit rapidly at 4.5 ft.
10					
12					
				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	HRS. AFTER COMPL.

15 x 4 x 12 = 720 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - = Vol. - Cu. Ft.
Over 18" DIAM: No. - = Vol. - Cu. Ft.

SUMMARY

DEPTH 12.0 ft.
JAR SAMPLES -
BAGS SAMPLES 1 Bag
GROUNDWATER -
TEST PIT NO. 84-3

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 19±

EXPLORATION DATE: 4 Oct. 84

H & A REP.: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
	0.4			Dark brown loamy SILT, some medium to fine sand, trace gravel and roots.	See note TP 84-1
	1.0			RAILROAD TIES in loamy silt matrix.	
	1.4			Black silty SAND, trace cinders and gravel.	Obtained samples for chemical testing at 2.0 ft.
2	1.8			Yellow-brown to gray silty fine SAND.	
	2.2			Black silty fine SAND, trace coarse to medium sand and fine gravel.	
4	3.8			Grayish brown medium to fine SAND, little silt, coarse to fine gravel, cobbles, small boulders, with pockets of black sand, trace gravel.	Trapped water entered pit very rapidly at 4.2 ft.
6				Brownish gray to yellow-brown mottled silty CLAY, little fine sand, trace black very slightly organic silt pockets, shells and pockets of fine sand.	
8					
10					
12				Bottom of Exploration 12.0 ft.	

GROUNDWATER				SUMMARY			
DATE	TIME*	DEPTH/FT.					
See Note			15	x	4	x 12 = 720 Cu. Ft.	DEPTH 12.0 ft.
			(L)		(W)	(D)	JAR SAMPLES -
			BOULDERS				BAGS SAMPLES -
			8" to 18" DIAM: No. - = Vol. - Cu. Ft.				GROUNDWATER -
			Over 18" DIAM: No. - = Vol. - Cu. Ft.				TEST PIT NO. 84-4
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.					

TEST PIT REPORT

TEST PIT NO. 84-5

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2				Brown intermixed silty SAND, some gravel, little brick, shells, trace wood, metal, concrete, granite blocks, cobbles, small boulders.	
4	3.6			Brownish yellow-gray silty CLAY, some sand, trace brick, wood, gravel, cobbles, metal with medium to fine sand pockets.	
	4.7			Dark reddish brown silty SAND, little brick, trace clay, wood, cobbles.	
6	5.4			Yellow-brown to gray mottled silty CLAY, some sand, trace dark brown loam pockets with silt and fine sand pockets, trace gravel and lumps of peat.	
8				Bluish gray clayey SILT, little fine sand, trace black pockets, very slightly organic clayey silt, trace gravel and small cobbles, pockets of loam, wood, shells.	No water entered pit after 1.0 hr.
10					See note TP 84-1
12				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	• HRS. AFTER COMPL.

$$\frac{15}{(L)} \times \frac{4}{(W)} \times \frac{12}{(D)} = 720 \text{ Cu. Ft.}$$

BOULDERS

8" to 18" DIAM: No. — = Vol. — Cu. Ft.
Over 18" DIAM: No. — = Vol. — Cu. Ft.

SUMMARY

DEPTH 12.0 ft.
JAR SAMPLES —
BAGS SAMPLES 1 Bag
GROUNDWATER —
TEST PIT NO. 84-5

TEST PIT REPORT

TEST PIT NO. 84-6

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 17±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	1.2			Dark grayish brown silty medium to fine SAND, little coarse to fine gravel, trace coarse sand, cobbles, wood, loam, brick and bituminous pavement.	Concrete pile cap 4' X 5.5' X 2.5', 6" below ground surface inside of pit.
	1.9			Yellow-brown coarse to fine SAND, little coarse to fine gravel, trace silt and small cobbles.	
4	3.7			Tan-brown medium to fine SAND, trace coarse to fine gravel, coarse sand, silt and few small cobbles.	
				Yellow-brown mottled silty CLAY, little sand, trace shells.	
6	5.1			Dark bluish gray very slightly organic silty CLAY, trace fine sand with black organic sandy silt pockets. (6"Ø black cast iron sewer pipe at 6.0 ft.)	See note TP 84-1 No water entering pit after 1 hr. Chemical samples obtained from adjacent test pit 84-6A at 2.5 ft.
8					
10					
12					
				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.

12 x 8 x 12 = 1152 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - = Vol. - Cu. Ft.
Over 18" DIAM: No. - = Vol. - Cu. Ft.

SUMMARY

DEPTH 12.0 ft.

JAR SAMPLES -

BAGS SAMPLES -

GROUNDWATER -

TEST PIT NO. 84-6

TEST PIT REPORT

TEST PIT NO. 84-7

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 17±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
	0.2			Dark brown silty SAND, trace gravel, loam, roots, wood.	
	0.5			CONCRETE SLAB	
2		B1	0.5 1.5	Black CINDERS, trace sand, gravel and brick.	
	1.5			Yellow-brown rust-brown medium to fine SAND, trace coarse sand, silt with occasional small pockets of black cinders.	
4	3.7			Bluish gray clayey SILT, some fine sand.	
6	5.5			Dark bluish gray silty CLAY with very slightly organic silt pockets, trace sand and shells and pockets of medium to fine sand.	Soil wet at 5.0 ft. but no water entering pit.
8					See note TP 84-1
10					
12				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.

10 x 3 x 12 = 360 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - Vol. - Cu. Ft.
Over 18" DIAM: No. - Vol. - Cu. Ft.

SUMMARY

DEPTH 12.0 ft.
JAR SAMPLES -
BAGS SAMPLES 1 Bag
GROUNDWATER -
TEST PIT NO. 84-7

TEST PIT REPORT

TEST PIT NO. 84-8

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESI & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18.5±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
	1.7			Dark brownish gray sandy SILT, little gravel, trace loam, brick. (cemented in-situ)	
2				Yellow-brown gravelly coarse to fine SAND, trace silt and few small cobbles.	
	3.0				
4	4.0			Brown medium to fine SAND, little silt, trace coarse sand and coarse to fine gravel, small cobbles.	
6				Dark bluish gray very slightly organic clayey SILT to silty CLAY, trace fine sand and pockets of black organic silt.	See note TP 84-1
8					Trapped water seeping in very slowly at 3.8 ft.
10					
12					
				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	•

10 x 4 x 12 = 480 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - = Vol. - Cu. Ft.
Over 18" DIAM: No. - = Vol. - Cu. Ft.

SUMMARY

DEPTH 12.0 ft.

JAR SAMPLES -

BAGS SAMPLES -

GROUNDWATER -

TEST PIT NO. 84-8

TEST PIT REPORT

TEST PIT NO. 84-9

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESI & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18.5±

EXPLORATION DATE: 4 Oct. 84

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	1.9	B1	0.0 to 1.9	Dark gray to dark brownish black silty SAND, little gravel, trace black cinders, wood, metal, loam, cobbles.	See note TP 84-1 Trapped water entered pit very rapidly at 5.0 ft.
				Yellow-brown to gray-brown medium to fine SAND, trace coarse sand, coarse to fine gravel, silt and small cobbles.	
				Bluish gray very slightly organic silty CLAY to clayey SILT, trace pockets, black organic silt.	
				Bottom of Exploration 9.0 ft.	
4					
6					
8					
10					
12					

GROUNDWATER			10 x 4 x 9 = 360 Cu. Ft. (L) (W) (D)	SUMMARY	
DATE	TIME*	DEPTH/FT.		DEPTH	
See Note				9.0 ft.	
				JAR SAMPLES	-
				BAGS SAMPLES	1 Bag
				GROUNDWATER	-
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.	8" to 18" DIAM: No. - = Vol. - Cu. Ft. Over 18" DIAM: No. - = Vol. - Cu. Ft.	TEST PIT NO.	84-9

TEST PIT REPORT

TEST PIT NO. 84-10

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESI & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18±

EXPLORATION DATE: 4 Oct. 84

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	1.1			Dark brown silty medium to fine SAND, little gravel, trace loam, brick, roots, metal, cobbles.	See note TP 84-1 Pit excavated adjacent to granite block sea wall. Pit on slip side of wall. No water entering pit after 1 hour.
	1.5			Brown medium to fine SAND, little silt, trace coarse sand and gravel.	
	1.8			Black CINDERS.	
4	4.0			Dark brown medium to fine SAND, little silt and coarse to fine gravel, trace coarse sand, cobbles and brick fragments.	
	4.5			Yellow-gray silty CLAY, trace sand.	
6				Oyster SHELLS in a slightly organic silt matrix.	
8					
10					
12				Bottom of Exploration 10.0 ft. Unable to penetrate deeper. Pit caving in.	
GROUNDWATER				SUMMARY	
DATE	TIME*	DEPTH/FT.		15 x 5 x 10 = 750 Cu. Ft. (L) (W) (D)	DEPTH 10.0 ft.
See Note					JAR SAMPLES -
					BAGS SAMPLES -
					GROUNDWATER -
NOT ENCOUNTERED	X	*RS. AFTER COMPL.		BOULDERS 8" to 18" DIAM: No. - = Vol. - Cu. Ft. Over 18" DIAM: No. - = Vol. - Cu. Ft.	TEST PIT NO. 84-10

TEST PIT REPORT

TEST PIT NO. 84-11

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18.5±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
	0.2			CRUSHED STONE.	
	0.6			Brown silty SAND, little gravel, trace brick, loam.	
	1.1			Dark brown loamy SILT, some fine sand, trace gravel.	
2	2.0			Gray medium to fine SAND, little gravel and silt with pockets of dark brown loamy silt, brick.	
	3.1			Dark rust-brown coarse to fine SAND, little gravel and silt, small cobbles.	
4	3.8				Strong odor of petroleum from 3 ft. to 5 ft. depth.
		B1	4.0 -	Dark gray medium to fine SAND, little silt, trace coarse sand.	
	5.0		5.0	Dark bluish gray coarse to fine SAND, little silt and gravel, trace pockets of clay.	
6				Dark bluish gray silty CLAY to clayey SILT with lenses and pockets of silt, fine sand, trace black very slightly organic silt pockets, shells.	See note TP 84-1
8					No water entering pit after 1 hour.
					Obtained samples for chemical testing at 4.0 and 6.0 ft.
10				Bottom of Exploration 10.0 ft.	
12					

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	•

*RES. AFTER
COMPL.12 x 4 x 10 = 480 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - Vol. - Cu. Ft.
Over 18" DIAM: No. - Vol. - Cu. Ft.

SUMMARY

DEPTH 10.0 ft.
JAR SAMPLES -
BAGS SAMPLES 1 Bag
GROUNDWATER -
TEST PIT NO. 84-11

TEST PIT REPORT

TEST PIT NO. 84-12

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

FILE NO. 5556

LOCATION: See Plan

ELEVATION: 18±

EXPLORATION DATE: 4 Oct. 84

H & A REP.: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	0.2			Black BITUMINOUS PAVEMENT.	Obtained sample for chemical testing at 3.5 ft.
	1.0			Yellow-brown gravelly coarse to fine SAND, trace shells and small cobbles.	
				Dark brown loamy SILT, some sand, little gravel, brick, concrete, cobbles, small boulders.	
	3.1			Greenish gray silty SAND, trace gravel, coarse sand, cobbles.	
	4.2			Yellow-brown dark brown silty SAND, little gravel, trace brick and clay lumps.	
4					See note TP 84-1
6	5.4			Refusal on concrete "box" structure. Unable to penetrate.	No water entering pit after 2 hours.
8					
10					
12					

GROUNDWATER

DATE	TIME*	DEPTH/FT.				SUMMARY		
See Note			10	x	4	x	5.4	= 216
			(L)		(W)		(D)	Cu. Ft.
			BOULDERS			DEPTH 5.4 ft.		
			8" to 18" DIAM: No. - = Vol. - Cu. Ft.			JAR SAMPLES -		
			Over 18" DIAM: No. - = Vol. - Cu. Ft.			BAGS SAMPLES -		
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.				GROUNDWATER -		
						TEST PIT NO. 84-12		

TEST PIT REPORT

TEST PIT NO. 84-13

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

FILE NO. 5556

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

LOCATION: See Plan

CONTRACTOR: MARCHESI & SONS, EVERETT, MA

ELEVATION: 19±

EXPLORATION DATE: 4 Oct. 84

H & A REP: J. Humphrey

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	2.2			Dark brown loamy SAND, little silt, gravel, trace brick, metal, cobbles.	Obtained samples for chemical testing at 3.5 ft.
	3.0			Dark brown-yellow brown silty SAND, trace gravel, clay, brick, metal, wood.	
4	4.0			Very dark brown intermixed loamy SAND, some silt, little clay, trace gravel, brick, metal, cobbles and organic silt.	
	5.5			Yellow-brown bluish gray silty CLAY, some sand, trace gravel, brick, organic silt.	
6	6.0			Dark brown loamy SILT, little brick and gravel.	
				Yellow brown-gray silty CLAY, some sand.	See note TP 84-1 No water entering pit after 1 hour.
8	8.5			Black silty SAND, some cinders (very slight petroleum odor).	
	9.0			Yellow-brown silty SAND, little clay, trace gravel, brick.	
10	10.0			Dark brown clayey fine SAND, some silt, trace coarse to fine gravel, brick, wood, cobbles, concrete.	
12				Bottom of Exploration 12.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.				SUMMARY		
See Note			10	x	4	x	12	= 480 Cu. Ft.
			(L)		(W)		(D)	
			BOULDERS			DEPTH 12.0 ft.		
			8" to 18" DIAM: No. - = Vol. - Cu. Ft.			JAR SAMPLES -		
			Over 18" DIAM: No. - = Vol. - Cu. Ft.			BAGS SAMPLES -		
NOT ENCOUNTERED	X	* HRS. AFTER COMPL.				GROUNDWATER -		
						TEST PIT NO. 84-13		

TEST PIT REPORT

TEST PIT NO. 84-14

PROJECT: PIERS 1, 2 & 3, NORTHERN AVE., BOSTON, MA

FILE NO. 5556

CLIENT: HBC ASSOCIATES C/O CARPENTER & CO. INC.

LOCATION: See Plan

CONTRACTOR: MARCHESE & SONS, EVERETT, MA

ELEVATION: 18±

EXPLORATION DATE: 4 Oct. 84

EQUIPMENT USED: CASE 580D, 3/8 CU. YD. BACKHOE

H&A REP: J. Humphrey

Scale in Feet	Strata Change	Sample Number	Sample Depth Range	DESCRIPTION OF MATERIALS	REMARKS
2	0.2			Crushed STONE.	Trapped water entered pit very slowly at 5.0 ft. See note TP 84-1
	1.2			Dark brown silty SAND, little gravel, trace loam, brick, wood, metal, cobbles.	
	2.4			Very dark brown loamy SAND, some silt, trace coarse to fine gravel, wood, brick, metal.	
	2.9			Yellow-brown medium to fine SAND, little silt and gravel, trace loam and wood.	
	3.4			COBBLESTONE ROADWAY.	
4	4.8			Yellow-brown silty medium to fine SAND, trace coarse sand and gravel.	
	5.5			Yellow-brown medium to fine SAND, little silt, trace coarse to fine gravel, small cobbles.	
6				Bluish gray clayey SILT, some fine sand with silt and fine sand layers and pockets, trace very slightly organic silt with shells.	
8					
10					
12				Bottom of Exploration 10.0 ft.	

GROUNDWATER

DATE	TIME*	DEPTH/FT.
See Note		
NOT ENCOUNTERED	X	•

HRS. AFTER
COMPL.10 x 4 x 10 = 400 Cu. Ft.
(L) (W) (D)

BOULDERS

8" to 18" DIAM: No. - Vol. - Cu. Ft.
Over 18" DIAM: No. - Vol. - Cu. Ft.

SUMMARY

DEPTH 10.0 ft.
JAR SAMPLES -
BAGS SAMPLES -
GROUNDWATER -
TEST PIT NO. 84-14

Appendix B

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APPENDIX B
RESULTS OF CHEMICAL ANALYSIS



Cambridge Analytical Associates

1106 Commonwealth Avenue / Boston, Massachusetts 02215 / (617) 232-2207

FINAL REPORT

Haley and Aldrich
238 Main Street
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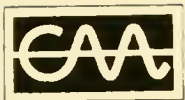
PROJECT NUMBER: 5556
Piers 1, 2 and 3

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

REPORT NUMBER: 84-1213

PREPARED BY: David L. Fiest

DATE PREPARED: November 9, 1984
(Revised December 3, 1984)



Cambridge Analytical Associates

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Certification

1. INTRODUCTION

This report summarizes results of chemical analyses performed on samples received by CAA on October 11, 1984. Analytical methods employed for these analyses are described in Section 2 and results are presented in Section 3. The last section contains certifications supporting the analytical results.

2. ANALYTICAL METHODS

Analytical methods utilized for sample analysis are summarized in Table 1.

3. RESULTS

Results of analyses are presented in Tables 2, 3, 4, 5 and 6.

Table 1. Summary of Analytical Methods

Constituent	Method Reference	Method Description
<u>Metals</u>		
Sample Preparation	Method 3050 (4)	Acid-digestion
As	Method 206.2 (1)	Graphite Furnace AAS
Cd	Method 213.1 (1)	Flame AAS
Cr (total)	Method 200.7 (1)	ICP
Cu	Method 200.7 (1)	ICP
Pb	Method 239.2 (1)	Flame AAS
Hg	Method 245.5 (1)	Cold-vapor AAS
Ni	Method 200.7 (1)	ICP
V	Method 200.7 (1)	ICP
Zn	Method 200.7 (1)	ICP
Total Phosphorus	Method 365.3 (1)	Colorimetric, ascorbic acid
Ammonia	Method 350.2 (1)	Distillation, colorimetric
Total Phenols	Method 420.1 (1)	Distillation, colorimetric
Total Kjeldahl Nitrogen	Method 351.3 (1)	Acid-digestion, distillation, colorimetric
Chemical Oxygen Demand	Method 410.4 (1)	Digestion, colorimetric
Chloride	Method 325.3 (1)	Water extraction, titrimetric
Total Solids	Method 160.3 (1)	Gravimetric, dried @ 180°C
Volatile Solids	Method 160.4 (1)	Gravimetric, ignition @ 550°C
Water Content	Method 160.3 (1)	Gravimetric, dried @ 180°C
Pesticides/PCBs	Method 608 (2)	Solvent extraction, gas chromatography/electron capture detection
Petroleum Hydrocarbons	Method 6 (3)	Solvent extraction, capillary gas chromatography/flame ionization detection
Oil and Grease	Method 413.1 (1)	Solvent extraction, gravimetric determination
Volatile Organics	Method 624 (2)	Purge and trap, gas chromatography/mass spectrometry

(1)U.S. EPA. 1979. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020 (Revised, March 1983). EPA/EMSL, Cincinnati, Ohio.

(2)U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

(3)Warner, J.S. 1978. Chemical Characteristics of Marine Samples. API Publication No. 4307. API, Washington, D.C.

(4)U.S. EPA. 1982. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods. SW-846. Office of Solid Waste, U.S. EPA, Washington, D.C.

AAS - Atomic absorption spectrophotometry

ICP - Inductively coupled argon plasma emission spectroscopy

CAMBRIDGE ANALYTICAL ASSOCIATES

Table 2. Concentrations of Petroleum Hydrocarbons and Oil and Grease

Client: Haley and Aldrich

Date Samples Received: October 11, 1984

CAA Project No.: 84-1213

Date Analysis Completed: October 30, 1984

Sample ID	CAA ID	Oil and Grease (mg/g, dry weight)	Petroleum Hydrocarbons (ug/g, dry weight-ppm)	Source
TP84-6A	8406733	13.8	-	-
TP84-12	8406734	1.8	-	-
TP84-13	8406735	1.2	-	-
TP84-11	8406736	3.0	4,200	Microbially- degraded No. 2 fuel oil
TP84-7	8406737	0.3	-	-

Table 3. Concentrations of Metals and Inorganics

Client: Haley and Aldrich
CAA Project No.: 84-1213

Constituent	Client ID: TP84-6A CAA ID: 8406733	TP84-12 8406734	TP84-13 8406735	TP84-11 8406736
<u>Metals</u> (ppm, dry weight)				
As	21	18	19	9.7;7.0 ^a
Cd	<1	<1	<1	<1; <1 ^a
Cr (total)	19	14	17	6.4;6.2 ^a
Cu	38	21	30	12;12 ^a
Pb	90	160	83	<10; <10 ^a
Hg	0.30	0.15	0.16	<0.02; <0.02 ^a
Ni	24	17	17	8.7;8.5 ^a
V	50	24	33	13;12 ^a
Zn	90	78	81	63;63 ^a
<u>Other Inorganics</u> (ppm, dry weight)				
Mositure (%)	1.9	7.5	12.5	7.2
Total Volatile Solids (%)	6.1	1.7	3.1	0.46
Chloride	27;18 ^a	58	110	22
Phosphorus (Total as P)	2,500	2,500	65	750
Nitrogen (as N)				
-Ammonia	16;15 ^a	9.7	7.7	7.3
-TKN	231.9 ^a	261.89 ^a	1531.45	90.27
Phenols	1.2	5.6	0.94	2.4
Total Solids (%)	98.1	92.5	87.5	92.8

^aDuplicate analyses performed.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 4. Concentrations of Priority Pollutant Volatile Organic Compounds (Method 624)

Client: Haley and Aldrich
 CAA Project No.: 84-1213

Date Samples Received: October 11, 1984
 Date Analysis Completed: October 24, 1984

Concentration - ug/kg wet weight (ppb)¹

Sample ID: TP84-11
 CAA ID: 8406736

Compound

(1)	chloromethane	
(2)	bromomethane	
(3)	vinyl chloride	
(4)	chloroethane	
(5)	methylene chloride	
(6)	1,1-dichloroethylene	
(7)	1,1-dichloroethane	
(8)	trans-1,2-dichloroethylene	
(9)	chloroform	
(10)	1,2-dichloroethane	
(11)	1,1,1-trichloroethane	
(12)	carbon tetrachloride	
(13)	bromodichloromethane	
(14)	acrylonitrile	
(15)	acrolein	
(16)	1,2-dichloropropane	
(17)	trans-1,3-dichloropropene	
(18)	trichloroethylene	
(19)	chlorodibromomethane	
(20)	1,1,2-trichloroethane	
(21)	benzene	
(22)	cis-1,3-dichloropropene	
(23)	2-chloroethylvinyl ether	
(24)	bromoform	
(25)	1,1,2,2-tetrachloroethane	
(26)	tetrachloroethylene	
(27)	toluene	
(28)	chlorobenzene	
(29)	ethylbenzene	
(30)	total xylenes	240
	other hydrocarbons	7,500
Detection Limit		25

¹Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the detection limit are listed as trace levels (TR). Detection limits for acrolein and acrylonitrile are 100 and 10 times the nominal detection limit respectively.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 5. Concentrations of Chlorinated Pesticides and PCBs (Method 608)

Client: Haley and Aldrich

Date Samples Received: October 11, 1984

CAA Project No.: 84-1213

Date Analysis Completed: October 31, 1984

Concentration - ug/g dry weight (ppm)¹

Compound	Sample ID:	TP84-6A	TP84-12	TP84-13	TP84-11	TP84-7
	CAA ID:	8406733	8406734	8406735	8406736	8406737

PESTICIDES AND PCBs

(1) a-BHC

(2) b-BHC

(3) d-BHC

(4) g-BHC (lindane)

(5) heptachlor

(6) aldrin

(7) heptachlor epoxide

(8) a-endosulfan

(9) dieldrin

(10) 4,4'-DDE

(11) endrin

(12) b-endosulfan

(13) 4,4'-DDD

(14) endrin aldehyde

(15) endosulfan sulfate

(16) 4,4'-DDT

(17) methoxychlor

(18) chlordane

(19) toxaphene

(20) PCB - 1016

(21) PCB - 1221

(22) PCB - 1232

(23) PCB - 1242

(24) PCB - 1248

(25) PCB - 1254

(26) PCB - 1260

Detection Limit

0.1

0.1

0.1

0.1

0.1

¹ Concentrations less than the limit of detection are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

ANALYTICAL ASSOCIATES, INC.

Table 6. Concentration of Acid/Base/Neutral Priority Pollutant Extractables (Method 8270)

Client: Haley and Aldrich
CAA Project No.: 84-1213

Date Samples Received: October 11, 1984
Date Analysis Completed: November 2, 1984

Concentration - ug/g dry weight (ppm)¹

Compound	Sample ID:	TP84-11
	CAA ID:	8406736

ACID COMPOUNDS

- (1) phenol
- (2) 2-chlorophenol
- (3) 2-nitrophenol
- (4) 2,4-dimethylphenol
- (5) 2,4-dichlorophenol
- (6) p-chloro-m-cresol
- (7) 2,4,6-trichlorophenol
- (8) 2,4-dinitrophenol
- (9) 4-nitrophenol
- (10) 4,6-dinitro-2-methylphenol
- (11) pentachlorophenol

Detection Limit

0.5

BASE/NEUTRAL COMPOUNDS

- (1) N-nitrosodimethylamine
- (2) bis(2-chloroethyl)ether
- (3) 1,3-dichlorobenzene
- (4) 1,4-dichlorobenzene
- (5) 1,2-dichlorobenzene
- (6) bis (2-chloroisopropyl) ether
- (7) N-nitrosodi-n-propylamine
- (8) hexachloroethane
- (9) nitrobenzene
- (10) isophorone
- (11) bis(2-chloroethoxy)methane
- (12) 1,2,4-trichlorobenzene
- (13) naphthalene
- (14) hexachlorobutadiene
- (15) hexachlorocyclopentadiene
- (16) 2-chloronaphthalene
- (17) dimethyl phthalate

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 6 (cont'd.). Concentration of Acid/Base/Neutral Priority Pollutant Extractables (Method 8270)

Client: Haley and Aldrich

CAA Project No.: 84-1213

		Concentration - ug/g dry weight (ppm) ¹
Compound	Sample ID: CAA ID:	TP84-11 8406736
BASE NEUTRAL COMPOUNDS (cont'd.)		
(18) acenaphthylene		
(19) acenaphthene		
(20) 2,4-dinitrotoluene		
(21) 2,6-dinitrotoluene		
(22) diethyl phthalate		
(23) 4-chlorophenyl phenyl ether		
(24) fluorene		
(25) N-nitrosodiphenylamine		
(26) 1,2-diphenylhydrazine		
(27) 4-bromophenyl phenyl ether		
(28) hexachlorobenzene		
(29) phenanthrene		
(30) anthracene		
(31) di-n-butyl phthalate		
(32) fluoranthene		
(33) benzidine		
(34) pyrene		
(35) butyl benzyl phthalate		
(36) 3,3'-dichlorobenzidine		
(37) benzo(a)anthracene		
(38) bis(2-ethylhexyl)phthalate		
(39) chrysene		
(40) di-n-octyl phthalate		
(41) benzo(b)fluoranthene		
(42) benzo(k)fluoranthene		
(43) benzo(a)pyrene		
(44) indeno(1,2,3-cd)pyrene		
(45) dibenzo(a,h)anthracene		
(46) benzo(ghi)perylene		
2-methyl naphthalene		4.4
Detection Limit		0.5

¹ Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

² Analyzed as azobenzene.

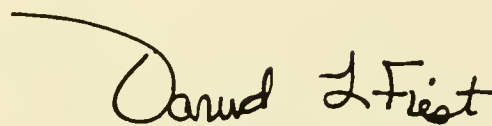
³ Analyzed as diphenylamine.

4. QUALITY ASSURANCE DOCUMENTATION

Certification

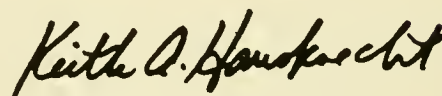
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Director, Organic
Chemistry Laboratory

A handwritten signature in cursive script, reading "David L. Fiest". The signature is written in dark ink and is positioned above a horizontal line.

David L. Fiest

Director, Inorganic
Chemistry Laboratory

A handwritten signature in cursive script, reading "Keith A. Hausknecht". The signature is written in dark ink and is positioned above a horizontal line.

Keith A. Hausknecht

Appendix C

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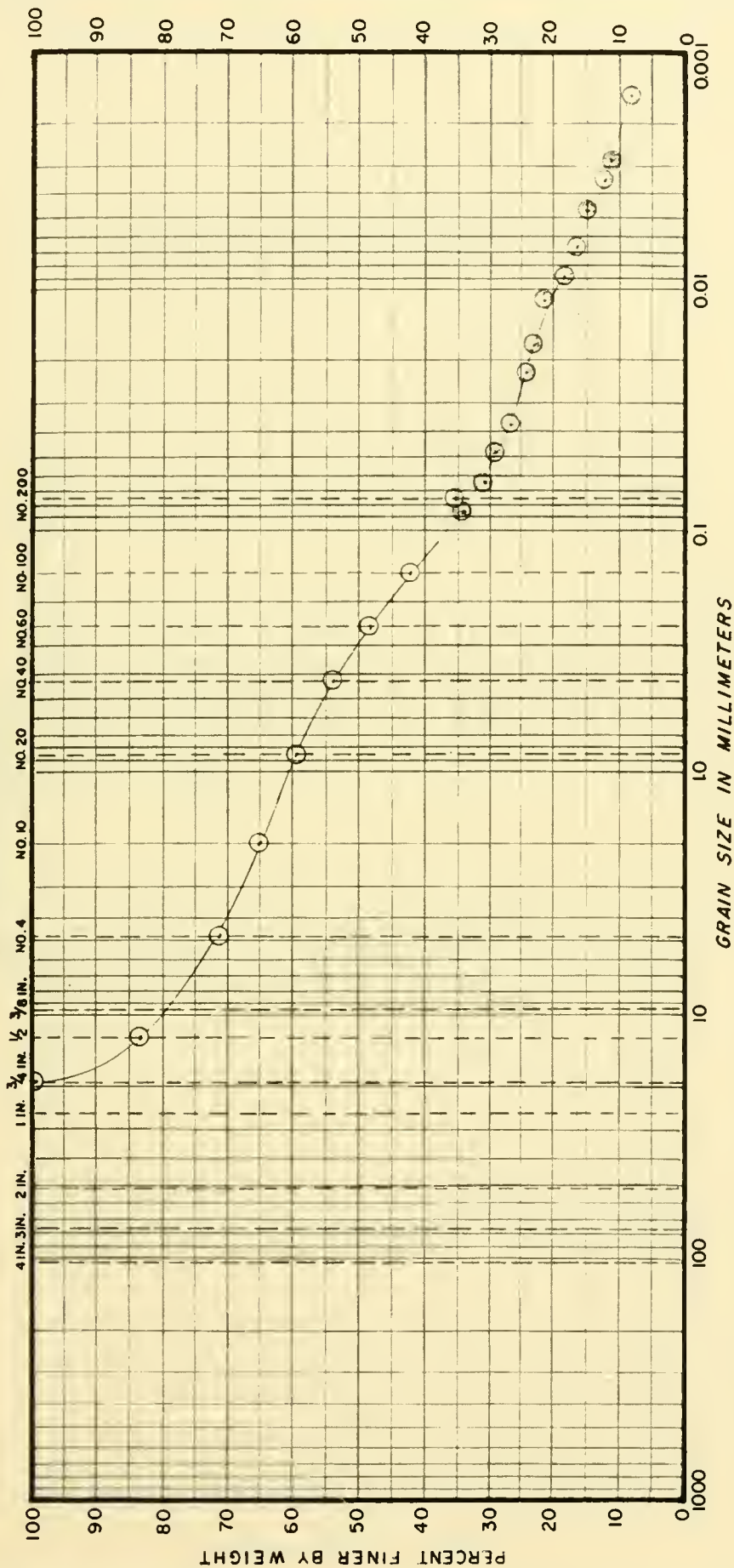
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APPENDIX C
SUMMARY OF LABORATORY SOIL TEST RESULTS

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S. ARMY

EXPLORATION NO.: TP84-6A

SAMPLE NO.: S-1

DEPTH (FT): 2.5

DESCRIPTION:

Brown gravelly coarse to fine SAND, some silt, trace clay.

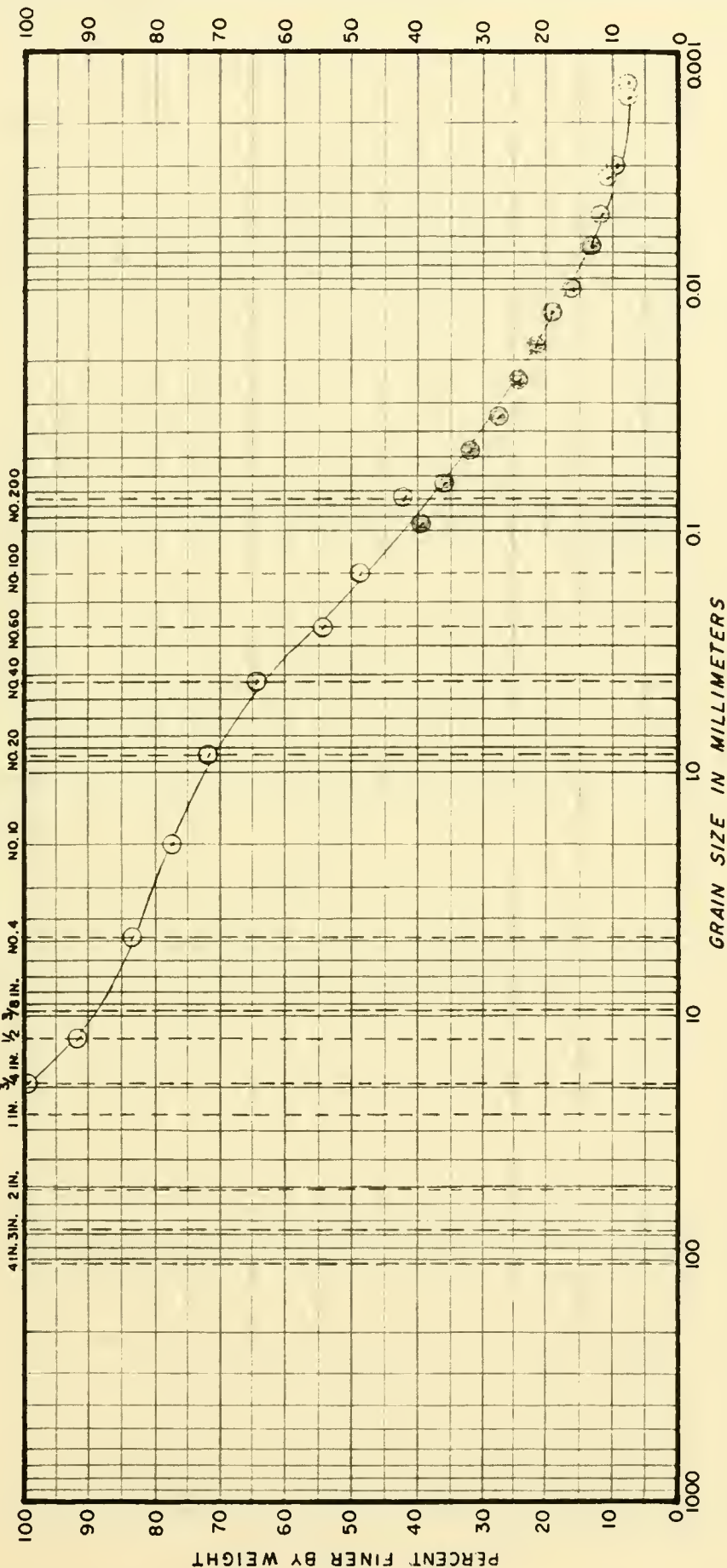
PROJECT PERS I, II, III

NORTHERN AVENUE, BOSTON, MA

FILE NO. 5556 DATE OCT. 1984

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S. ARMY

EXPLORATION NO.: TP84-13

SAMPLE NO.: S-1

DEPTH (FT): 3.5

DESCRIPTION:

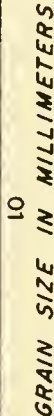
Brown silty coarse to fine SAND, little gravel, trace clay.

PROJECT PIERS I, II, III

NORTHERN AVENUE, BOSTON, MA

FILE NO 5556 DATE OCT. 1984

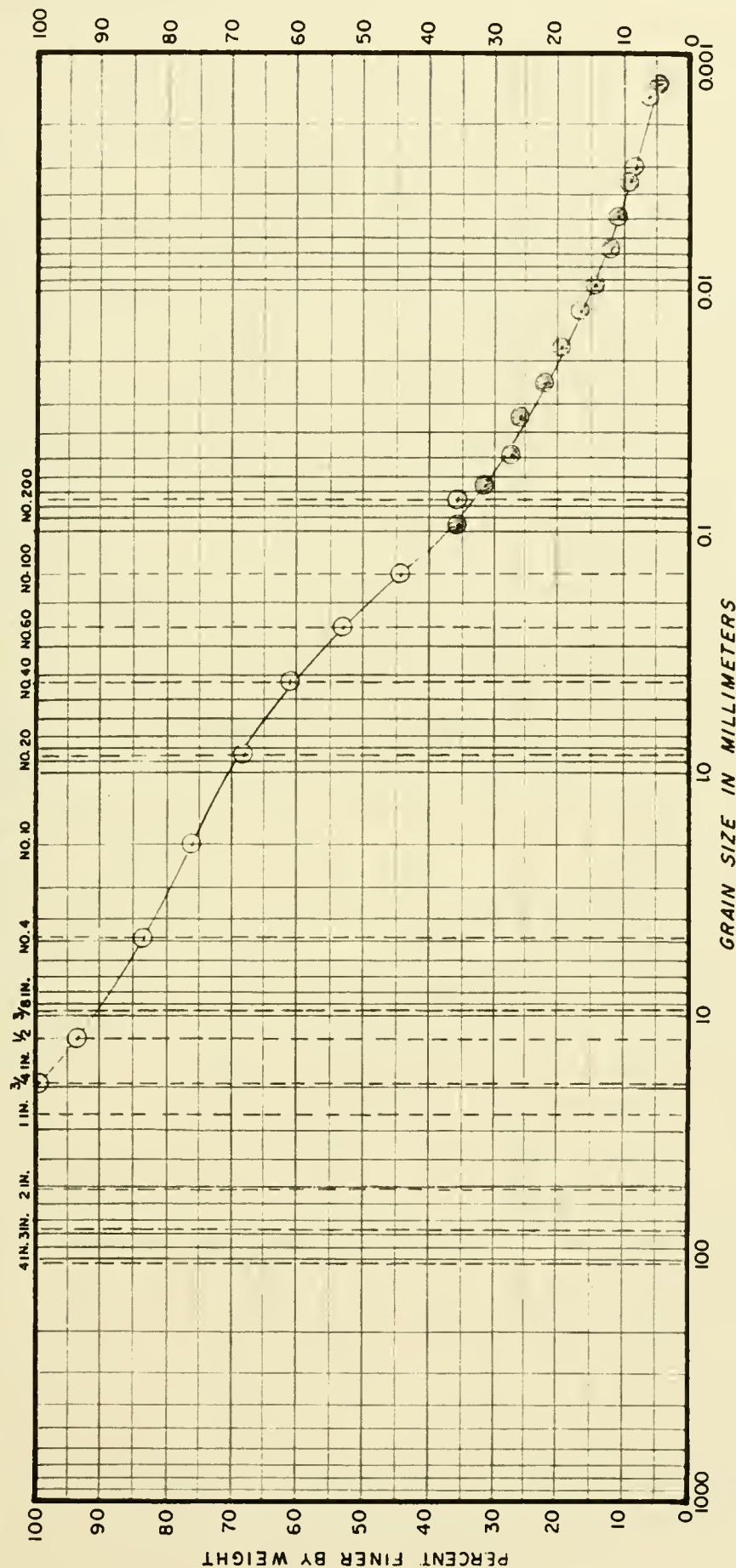
U. S. STANDARD SIEVE SIZE

UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S. ARMY

DESCRIPTION: Brown gravelly coarse to fine SAND, trace silt.

FILE NO. 5556 DATE OCT. 1984

U. S. STANDARD SIEVE SIZE



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM, CORPS OF ENGINEERS, U.S. ARMY

EXPLORATION NO.: TP84-12

SAMPLE NO.: S-1

DEPTH (FT) : 4.5

DESCRIPTION: Brown silty coarse to fine SAND, little gravel, trace clay.

PROJECT PIERS I, II, III

NORTHRN AVENUE, BOSTON, MA

FILE NO 5556 DATE OCT. 1984

Appendix D

Appendix D.1

Appendix D.1.1

Appendix D.1.1.1

Appendix D.1.1.2

Appendix D.1.1.3

Appendix D.1.1.4

Appendix D.1.1.5

Appendix D.1.1.6

Appendix D.1.1.7

Appendix D.1.1.8

Appendix D.1.1.9

Appendix D.1.1.10

Appendix D.1.1.11

Appendix D.1.1.12

Appendix D.1.1.13

Appendix D.1.1.14

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Appendix D.1.1.28

Appendix D.1.1.29

Appendix D.1.1.30

Appendix D.1.1.31

Appendix D.1.1.32

Appendix D.1.1.33

Appendix D.1.1.34

Appendix D.1.1.35

APPENDIX D
LIST OF REFERENCES

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1. Haley & Aldrich, Inc. telephone conversation with Zoning Department of Boston Redevelopment Authority on 4 October 1984.
2. Chesblough, E. S. Map of Boston Harbor Showing Commissioner's Lines Wharves and C, Boston, 1852.
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4. Plan of South Boston Flats showing locations of seawalls and area of excavation and filling, scaled 1 in . = 200 ft., (1875).
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List of References - Page 2

14. Haley & Aldrich, Inc. telephone conversation with Boston Fire Department on 4 October 1984.
15. Interview with Mr. Pat Moreno, owner of Santoro's Sub Shop on 4 October 1984.
16. Observations made during site visit on 4 October 1984.

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